their effort to the legitimate function of science—the discovery of natural phenomena and their classification into general laws by logical mathematical processes?" (p. 31).

The account of the growth of the mechanistic view in science and of atomism, and the criticism of them and development of a science of energetics by Rankine, Mach, Duhem, and Ostwald, are fairly adequate, and direct attention to some points—notably in Rankine's attitude—which have been forgotten by most people. It is rather disappointing to find no mention of Stallo's extremely important work in the theory of knowledge, especially when we see that the second chapter is headed "The Metaphysical Tendencies of Modern Physics," and read such passages as that on p. 70. But Prof. More's problem is not quite the same as Stallo's. In Stallo's time physicists vigorously denied that their theories had a metaphysical basis, and it was Stallo's purpose to show that the physicists were mistaken in their denial. But at the present time such a theory as Larmor's has an avowedly philosophical background. The great obligation of modern physics to Descartes is seen from the admirable discussion of Descartes' physical system in chapter iii. "A comparison of his [Descartes'] postulates and conclusions with those of our modern theory shows them to be almost identical, if we change his antiquated knowledge and his discarded metaphysical language into modern terminology" (p. 67; *cf.* pp. 98, 101).

The fourth chapter is a reprint of an article in the *Philosophical Magazine,* and, under the heading "The Scientific Method," contains a very sensible critical review of recent physical theory. Prof. More himself advances a hypothesis to make the ratio e/m agree with the experimental evidence (p. 140). The fifth chapter is on "The Classical and the New Mechanics," and here Prof. More concludes that, if we finally adopt the most modern thesis that matter is the manifestation of energy, we are acknowledging that "the guides to knowledge are now to be found in those subjective impressions which must depend on the individual, and vary with him. . . . The classical natural philosophy of Newton and Galileo has drifted into that transcendental symbolism which is apt to take place when German thinkers become the leaders in philosophy" (p. 163). The sixth chapter is on "Skepticism and Idolatry in Science," and here some of the writings of Poincaré and Sir Oliver Lodge make admirable illustrations; and the seventh chapter is on "Science as the Arbiter of Ethics." This is a thoughtful book, and though easy to read, is not superficial.

(2) Mr. Redgrove's book makes a great point of the fact that experience is subjective, as Berkeley pointed out, and of which Mach has made such illuminating use in physics. Of course materialism becomes easily refutable from this point of view. Mr. Redgrove leans to the mysticism of John Smith the "Cambridge Platonist," Boehme, and Swedenborg, but—and this would surprise some after that—he adopts what seems to be a very sensible attitude in his emphasis on the validity of the laws of nature, and the fallacy of "Christian Science" metaphysics. Mr. Redgrove follows Mill in thinking that mathematical truth is merely founded on experience, and holds that absolute truth is unknown and unknowable. In spite of this we may approach truth, "just as a mathematical series may for ever progress towards some limit which it never reaches" (p. 86). The mathematical illustrations seem to be quite irrelevant: we might just as well illustrate a fanciful doctrine that we can attain the limits of knowledge over and over again in our lives, and yet approach no definite knowledge, by instancing the function sin x as x proceeds to infinity along the real axis.

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RECENT ELECTRICAL BOOKS.

(1) *Arithmetic of Alternating Currents.* By E. H. Crapper. Pp. vii + 208. (London: Whittaker and Co., 1915.) Price 2*s.* 6*d.* net.

(2) *Constant-voltage Transmission: a Discussion of the Use of Synchronous Motors for Eliminating Variation in Voltage in Electric Power Systems.* By H. B. Dwight. Pp. vii + 115. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1915.) Price 5*s.* 6*d.* net.

(3) *Alternating-current Work: an Introductory Book for Engineers and Students.* By W. P. Maycock. Pp. xxiii + 415. (London: Whittaker and Co., 1915.) Price 6*s.* net.

(4) *Experimental Electricity and Magnetism.* By M. Finn. Pp. x + 436. (London: G. Bell and Sons, Ltd., 1915.) Price 4*s.* 6*d.*

(1) PROF. E. H. CRAPPER'S book can be recommended to all desiring to obtain a thorough working knowledge of the everyday calculations which have to be made by alternating-current engineers. The lengthy experience the author has had in training electrical engineers has convinced him that the only way to master the subject is to acquire facility in solving the types of numerical problems which occur in practice. There are 232 examples in the book. The answers to all of them are given, and fifty are worked out in full. They are arranged in order of difficulty, and none of them make excessive demands on the

knowledge or ability of the student. We have tested the numerical accuracy of the answers given to several of the problems with satisfactory results.

(2) Mr. H. B. Dwight is the electrical engineer to the Canadian Westinghouse Company, and is one of the greatest authorities on long-distance power transmission. To the reader conversant with the technicalities of electrical engineering this book can be warmly recommended. The author points out the advantages of using special synchronous motors to keep the voltages at the distributing stations constant under all conditions of load. By this means the radius of action of electric power transmission can be very considerably increased. The main advantage gained by this increase of distance is that it renders possible the linking together of large networks either directly or by suitable "frequency transformers." The economies rendered possible by this procedure are well known and much thought about by electrical engineers. Unfortunately the main difficulties in linking up all the supply companies in London have to do with the vested interests concerned and the inherent conservatism of station engineers.

In America there are several large networks already in existence. In North and South Carolina, for instance, over a thousand miles of 100,000-volt transmission lines are now linked together, the lines stretching across 800 miles of country. The Pacific Gas and Electric Company of California has a network of 1500 miles, part of it being at 60,000 and part at 100,000 volts. It is highly probable that even this extended supply of "electricity in bulk" will seem quite small in a few years' time, as some of the many schemes projected for linking up systems of electric railways are sure to be carried out. Mr. Dwight's book, therefore, discusses a problem of great commercial and economic value. In discussing the more technical side of the problem Mr. Dwight uses complex hyperbolic operators, and has been successful in considerably simplifying the usual treatment.

(3) Mr. W. Perren Maycock's book is intended as an introduction to alternating-current work. The diagrams are beautifully clear, the apparatus described is all useful and fundamental, and the descriptions are good. Simplified vector diagrams are given. Many will find this work useful as an introduction to more advanced treatises.

The defects of the book are due mainly to an attempt to explain to the non-mathematical reader certain steps in the proofs of physical theorems which demand mathematical knowledge. Unless these steps are proved rigorously it does not seem worth while to give them. No proof, for instance, is given that when the voltage follows the harmonic law its effective value equals 1·11 times its average value. To assume this, and to point out in reasoning backwards that

$$1{\cdot}11 = 0{\cdot}707/0{\cdot}636 = \pi/(2\sqrt{2}),$$

is rather a futile proceeding. It would be better to state definitely that the value 1·11 used by the designer of alternating-current apparatus is approximately equal to $\pi/(2\sqrt{2})$, which is the value deduced theoretically from the properties of the sine curve.

(4) From the point of view of the teacher, the chief merit of Mr. Finn's book is its thoroughly practical nature. Assuming that the physical laboratory is fitted with the electric light, he shows that many excellent and instructive experiments can easily be arranged for junior students. The student will appreciate the notes on heat and dynamics which are freely interpolated throughout the text. The introduction and explanation of technical terms in common use are innovations which are to be commended. Everyone should know what is meant by an adapter, a wall-plug, a kilowatt-hour, bayonet and screw cap lampholders, etc. We think also that all teachers should know what is meant by "earthing," and that one of the mains of the supply company is usually earthed. Electrical students have generally very hazy notions about what is meant by the potentials of the supply mains. They seem to have acquired at school the notion that difference of potential is the only thing that need be considered, and that the absolute value of the potential is of no consequence. A good teacher could easily explain the fallacy of this by pointing out how workmen sometimes get dangerous shocks owing to neglect of certain very elementary precautions.

In one or two places the author's experiments are perhaps too elementary. For example, it seems unnecessary to prove that the currents in conductors in parallel are not always equal to one another. In some places the wording is clumsy. On p. 374, for instance, instead of saying "the bigger is the dielectric strength said to be," it would be better to say "the greater the electric strength." We are told that the "dielectric constant" of a medium "varies somewhat with the length of time for which the E.M.F. is applied." Whether this is true or not depends on how we define the dielectric constant. It certainly varies with temperature. Everyone must perforce admit that it is not a constant. It seems foolish, therefore, for physicists to go on calling it a constant. The terms inductivity, dielectric coefficient, and S.I.C. are in use. There is no excuse therefore, for using the word "constant" for a variable quantity.

After defining the electrostatic unit of potential, the author goes on to say that "it follows" that the electrostatic unit $=3\times 10^{10}$ A.E.M.U.'s of E.M.F. $=300$ volts. It would be a phenomenal beginner who was able to follow this reasoning without further explanation. A. Russell.

OUR BOOKSHELF.

Overcrowding and Defective Housing in the Rural Districts. By Dr. H. B. Bashore. Pp. 92. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1915.) Price 4*s.* 6*d.* net.

We are apt to associate overcrowding and defective housing with towns in the "old" countries, but it is well to realise that a condition of things as bad or worse may exist in our rural districts and in new settlements. In this little book Dr. Harvey Bashore, an inspector in the Pennsylvania Department of Health, describes conditions of overcrowding and defective housing which exist in his own district. He deals with the subject under four headings: (1) land overcrowding; (2) house overcrowding; (3) defective buildings; and (4) overcrowded and defective schools.

Instances of these various conditions, illustrated by well-reproduced plates, are given, and the results are summarised in a concluding chapter. The latter are exactly the same as in the great cities—lack of efficiency, disease, and premature disease to many—"while the great majority of people subjected to overcrowding and bad housing do not prematurely die, yet they have a lessened physical and mental vigour and are less able to do properly their daily work, and not only become a loss to themselves and their families, but to the State; and for ever stand on the threshold of that dread disease—tuberculosis; for tuberculosis is the one great disease of the overcrowded." As regards the remedy, Dr. Bashore says: "This problem cannot be attacked, as in the great cities, by legislative enactment or resort to legal measures, but the solution lies in proper education by the health authorities, by the schools, and by the Press, and the crusade must be kept up until the people understand that it pays—pays in real dollars and cents—to live in sanitary homes."

Although written from the American view-point, we would commend this little book to the notice of councillors, landlords, and health visitors in this country. R. T. Hewlett.

Typical Flies. A Photographic Atlas of Diptera, including Aphaniptera. By E. K. Pearce. Pp. xii+47. (Cambridge: At the University Press, 1915.) Price 5*s.* net.

This volume contains four pages of introduction, with instructions for collecting and for setting specimens of flies caught, Brauer's Classification of Diptera (four pages), and 155 reproductions in half-tone of photographs of fleas and flies. Its aim is to be of service to the beginner and to draw attention to the interest of an order of insect that is much neglected.

The photographs are as good as any we have seen of this class of insect—a peculiarly difficult class to represent pictorially in any natural manner; the venation of the wings is well brought out wherever the banding or colouring of the wings does not obscure it, and there are excellent short notes as to habitat, larval habits, and so on under the pictures. We wish it had been possible to provide under the photographs line drawings of the more important types of venation and of some of the antennæ; but the interest taken in this group is so little that we imagine further expenditure on the volume was impossible.

The diversity of appearance is well brought out; to the student the venation systems depicted will be helpful, and to the beginner the variety of habitat and habit will be distinctly stimulating.

Probably no order of insect will so well repay the collector and investigator in this country, and we hope this volume may stimulate a wider interest in this fascinating group. H. M.-L.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

Destruction of Wasps.

You may be interested to know that whilst starting up a motor-cycle a few days since, I accidentally discovered that benzol sprayed over a wasp instantly killed it. I tried the same experiment with petrol with the same result.

Knowing of two nests in the neighbourhood I went that night and with a small oil gun injected two or three ounces of benzol into each nest. In the morning I found the two nests entirely destroyed.

Next night I visited an open nest which had been partly destroyed by another means, and in which several hundred wasps were still living. They covered an area as large as a cheese plate, and on lighting them up showed signs of activity. One squirt full of petrol was hastily sprayed over them, and the whole lot were instantly killed.

This method is so safe, simple, and effective that I feel it should be generally known. The petrol or benzol acts entirely by vaporisation and produces asphyxiation. It is not fired in any way.

A. H. Mitchell.

Horn's Green, Knockholt, Kent, August 24.

Atlantic Oceanic Currents.

A large bell-buoy was cast ashore at Porto Santo, the northern island of the Madeira group, in the early days of March in the present year.

I have ascertained that the buoy came from Pearl Reef, Magdalen Islands, in the Gulf of St. Lawrence, having broken adrift from its moorings in the autumn of 1912, occupying thus two years and a half in transit. These facts are important at a time when our accepted notions of the strength and direction of the Atlantic currents are undergoing revision.

It may be remembered that Christopher Columbus, who resided at Porto Santo, and married a daughter of Peristrello, the Governor in those days, derived his inspiration and dream of lands beyond the sunset from the arrival of seed-pods and other suggestive matter drifting in upon the broad current which bathes these rocky shores. Michael C. Grabham.

Madeira, August 19.